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A Theory of Social License when Regulatory Pressure is Jointly Produced by an EPA and an NGO*

Anthony Heyes
University of Ottawa
University of Sussex

Marcel Oestreich†
Brock University

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Abstract

We develop a model in which social pressure on a firm to behave well is jointly produced by a state regulator (EPA) and an NGO. The EPA and NGO differ in how they trade-off business versus environmental interests and also have access to different instruments in pursuit of their objectives. EPA and NGO efforts may be strategic complements or substitutes, depending upon circumstances. We present a taxonomy of outcomes in the game between EPA and NGO in the spirit of Fudenberg and Tirole's (1984) classic taxonomy of business strategies. We also consider strategic delegation from NGO supporters to an NGO that has tastes over environmental and business interests different to their own.

Keywords: Environmental regulation; private politics; strategic delegation; NGOs; social license.

JEL classification: D62; H83; L51

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†Corresponding author. Email: moestreich@brocku.ca. Phone: +1(905)688-5550 ext.: 6252.

1 Introduction

Firms are subject to pressure from society to behave well. Respect for the environment, eschewing child labor and exploitative labor practices, treating suppliers fairly, etc. are costly, so profit-motivated firms are tempted to cut corners. However, bad behavior, if detected, can also be hazardous to a firm's bottom line. In addition to the legal penalties that may result from breaking laws, firms face social or reputational penalties for being exposed as behaving badly. These penalties can be large, which explains recent interest in concepts such as 'social license', 'informal regulation' and 'beyond compliance behavior'.

There is no universally-agreed definition of *social license* in the management literature. Broadly speaking a firm is said to hold social license if it enjoys community or public support for its activities. There are many reasons why a business can perform better financially when community attitudes towards it are positive, implying that loss of support imposes a penalty. Firms - particularly those operating in key sectors where social license is critical - will invest substantially to avoid losing it. In mining, Prno and Solocombe (2012, page 346) note that "a social license exists when a firm is seen as having broad, ongoing approval and acceptance of society to conduct its activities" such that nurturing social license is "... one of the most significant challenges that mining companies face". *Informal regulation* is a closely-related concept and can be viewed as follows; "When (formal penalties) are weak or absent, communities can often use other channels to force pollution abatement by local factories in a process of informal regulation" (Pargal and Wheeler (1996: 1314)).

In most settings social pressure is something that is *jointly produced* by the actions of state (regulators) and non-state (NGO) actors. Typically the regulator and NGO can be expected to have different objectives (the former pursuing welfare, the latter more focussed on environmental outcomes), as well as access to different instruments. This means that the regulator, NGO and representative firm are in a three-way game, seeking strategically to influence community support to their own ends. In the context of a simple model that captures this interaction strategically, we develop a taxonomy of strategies - in the spirit of Fudenberg and Tirole's (1984) taxonomy of strategies for businesses in a competitive environment - that characterizes the roles of the state regulator and the NGO as a function of some key underlying parameters.

Further, very often citizens do not engage in the application of pressure themselves. Rather, by donating money (or other support) to an NGO or activist organization, they delegate their bidding to a third party. Given this, it is natural to ask the following question: If I am a citizen with a particular set of preferences - defined by how I weigh environmental and non-environmental outcomes - what sort of NGO objectives would I want to support with my

donation? One that is sensitive to business interests, or one that attaches little or no weight to them? In our framework we show that a citizen typically will *not* wish to support an NGO with the same objectives as his or her own. Rather, in general the citizen will understand that the citizen's ends are better served by delegating the fighting of the battle to an NGO whose preferences over environmental versus non-environmental outcomes are systematically different in comparison to the preferences of the citizen.

In terms of the development of knowledge in this area the analysis allows us to speak to two questions. The first is how the roles of state enforcer and NGO fit together in a context in which compliance pressure is jointly produced, for instance settings in which social license to operate is important. The second relates to the question of what is the appropriate objective function with which to endow NGOs in our models. Existing models start with an *ad hoc* assumption about NGO objectives - usually based either on impact (for example Heyes and Martin (2015)) aggregate environmental damage (for example Heyes and Kapur (2012)) or a variant there-on. Our approach endogenizes the objective function that the activist group seeks to maximize, deriving it from (but not equating it to) the tastes of donors.

The second element fits into a wider literature on strategic delegation in other contexts. In Rogoff (1985) a politician with a particular taste for inflation and unemployment delegates control of monetary policy to a central banker more conservative (inflation-hating) than the politician. In Vickers (1985) and Fershtman and Judd (1987) a profit-maximising shareholder delegates the running of the firm to a chief who's objective function is not profit-maximization. In Heyes and Kapur (2011) a welfare-maximizing government appoints an EPA chief who is not welfare-oriented. In each case the appointment is instrumental - it makes credible a pattern of responses in a subsequent game that is to the ultimate benefit of the principal. In our setting the donor is the principal, and by donating to a particular NGO, the principal appoints that entity as agent to do the bidding on behalf of the principal.

The first complements a number of strands of research on the social behaviors of firms. There is a substantial body of theoretical and empirical research on corporate social responsibility (CSR) and behavior that goes beyond compliance (Arora and Gangopadhyay (1995) and Pargal and Wheeler (1996)). Related to this is the recent flurry of work on 'private politics' (Baron (2001, 2009), Baron and Diermeier (2007)). A second literature seeks to use formal methods to understand the organization and strategies of the social advocacy sector (Heyes and Martin (2015, 2016), Aldashev and Verdier (2009)). With particular focus on community pressure, Heyes and Kapur (2012) develop a model in which a firm engages in CSR in order to maintain community support and/or to regain the support of the community once it has been lost. They characterize how these incentives interact with formal regulatory interventions. Aldashev and Verdier (2013) analyze the effect of NGO pressure on industry

equilibrium (intensity of competition, market structure, and the share of socially responsible firms) and characterize the impact of industry-level changes (market size, consumer tastes) on NGO activism. Heyes and Maxwell (2004) model the interplay of a hypothetical World Environmental Organization and an NGO and find that lawsuits by private citizens crowd in public monitoring but crowd out public sanctions. Lambertini et al (2016) and Planer-Friedrich and Sahm (2017) outline a delegation approach to CSR. Walter and Chang (2017) analyse the welfare impacts of environmental regulations in the presence of green consumers. And finally, with an empirical focus Langpap and Shimshack (2010) present empirical evidence on the extent to which private environmental prosecutions crowd out - or crowd in - public monitoring and public enforcement efforts.

1.1 Joint Production of Social Pressure: Motivation and Model Preview

The starting point for the analysis that follows is the recognition that the pressure on firms to behave well - informal regulatory pressure - is *jointly produced* by governmental and non-governmental actors.

For the purposes of formal modeling we will treat these as single entities and refer to them generically as an Environmental Protection Agency (EPA) and a Non-governmental Organization (NGO). The EPA and NGO can be expected to have different objectives - the former pursuing welfare, the latter more interested in environmental outcomes - as well as different levers that they can use to further their aims.

A central assumption that we will make is that the EPA has the means to identify certain corporate behaviors, while the NGO influences public hostility to exposed bad behavior. Of course this will not be realistic in every setting, but is a reasonable approximation in many settings.[1] In our model we keep things stark. The EPA will choose the probability that bad behavior by a firm is exposed. It might do this through: (1) conducting inspections and publishing results (NGOs do not have the same rights to access plants and conduct inspections that regulators do); (2) requiring submission of data from polluters and disseminating it;

[1] The EPA may also have the power to levy financial penalties, but these penalties are often small compared to reputational losses (Heyes (2001)). Equally too activist groups may in some contexts play a role in the detection of wrongdoing. For example in the recent VW emissions scandal it was an NGO that conducted the testing that bought the wrongdoing to light. Couttenier et al (2016) develop a model in which an NGO is selective in the information it passes on to citizens. In such a pure disclosure game the NGO does not expend effort generating primary information, so presumably it often obtains the information that it has from governmental or other publicly available sources. For example, the International Council of Clean Transportation (ICCT) Ranking of Transatlantic Airline Fuel Efficiency, that the authors use as a motivating example in that paper, combines data from publicly available travel web-sites with data on fuel use and traffic occupancy rates reported to the US Department of Transportation (see ICCT (2015)).

and/or (3) mandating direct disclosure by firms of information about various elements of their social impact, or in other ways. The NGO will influence community attitudes to wrongdoing, including the hostility of the social 'atmosphere'; and therefore will influence the size of the social penalty a firm suffers if its bad behavior is exposed.[2] This sort of division has been noted by researchers and practitioners in the environmental field: "Regulators are learning the value ... of NGOs to help achieve environmental goals. Information regulation strategies, for example, are explicitly designed to empower NGOs (give them the information they need) to impose informal sanctions on firms based on their environmental record", (INECE (2005)).[3] The relationship between the NGO and EPA is symbiotic - they need each other.

To summarize the assumption in a phrase: In our model the EPA does the naming, the NGO does the shaming. To take a non-environmental analogue, while the efforts of *Mothers Against Drunk Driving* (MADD) over the last 30 years have substantially heightened the social vilification faced by people caught driving under the influence of alcohol, it still requires the police to pull-over and breathalyze miscreants.

The regulator in the model maximizes welfare (equally-weighted sum of compliance and operating costs and environmental damage), while the NGO usually *overweighs* environmental outcomes. This implies that there is tension between the two; they are not aligned in their preferred outcomes. The strategic interaction between the regulator and NGO in this set-up, and the properties of the resulting pattern of incentives that they jointly-produce, is our focus.

The rest of the paper is set out as follows.

In Section 2 we develop and solve a stylized model of the game between EPA and NGO. The key assumptions embedded in the model are: (a) formal penalties are limited (in fact zero) so that the state regulator must rely on social penalties (social disapproval) to discourage polluting behavior;[4] (b) the primary tool available to the regulator is information provision;

[2] A social penalty might take various form and the precise form is not important to us here. Gunningham et al (2004: 321)) report that: "Managers at BC4 told us that the sanction they feared most for breaching regulations were not legal but informal sanctions imposed by the public and the media, they were motivated less by avoiding regulatory violations per se than by avoiding 'anything that could give you a bad name'". Econometric evidence of the substantial size of social penalties is provided by Badrinath and Bolster (1996), and Pargal and Wheeler (1996) amongst others.

[3] We use the term 'bad behavior' loosely - it may or may not correspond to a firm's failure to satisfy a formal legal requirement. The literature on community right-to-know provisions in general and the US Toxic Release Inventory in particular demonstrates the potential power of information provision in this context. In Canada, the "environmental scorecard" published by the BC provincial government outlining environmental performance indicators was, according to one mill manager "a pretty effective tool. If you have recurring environmental problems you come up on the list. That keeps you in compliance because public pressure is more demanding than the regulatory agencies" (Gunningham et al (2004: 330)).

[4] Reputation here, however, is a social construct rather than something that emerges from a Bayesian updating process. This parallels Abito, Besanko and Diermeier (2015: 5): "Our notion of reputation is consistent with that employed in the sociology and management literatures - it is a social construct reflecting the public's subjective attitudes towards a company (Bermiss, Zajac and King (2013). It is not a posterior

(c) the hostility of the social atmosphere into which evidence of wrong-doing is published can be influenced by attitude-leadership by an NGO; and (d) the EPA and NGO may have different objectives - in particular the latter overweighs environmental outcomes over industry interests - and are strategic in how they behave.

An insight of the model is that in making decisions about how much effort to invest in a hostile social atmosphere, the strategic NGO will have regard not only to the direct effect on firms, but also to the induced changes in the actions of the EPA - it's 'partner' in the creation of social pressure. The efficacy of its own actions to whip-up a more hostile social atmosphere may be off-set if the EPA responds by scaling back the intensity of its own information-provision efforts.[5] In other circumstances the EPA may be induced to *expand* that intensity, and the NGO will be motivated to push *even harder* to exploit such crowding-in effects. In parallel the EPA, as a strategic actor in its own right, will realize that the intensity of the information provision program that it operates will influence the incentive that the NGO has to invest in a hostile community atmosphere. We characterize the reaction functions in the game between EPA and NGO. As in Fudenberg and Tirole (1984), and as the discussion in the previous paragraph suggests, critical to incentives in any given context turn out to be whether EPA and NGO intensity choices are strategic complements or substitutes. This depends in turn on a constellation of parameters. Taxonomic in character, the model generates numerous new insights that are inevitably missing from analyses (the existing literature) that fail to recognize that social pressures are *jointly-produced* by state and non-governmental actors.

While the taxonomy is insightful, providing as it does the first rigorous treatment of the joint production of social pressure, in Section 3 we use it as a building block to think about strategic delegation in activism. In particular we treat the NGO's objective function - the weight that the NGO places on environmental as opposed to non-environmental outcomes - as an institution-design parameter that it can choose in a pre-game. We caricature this as appointing an NGO 'chief' of a particular disposition, but the weight can equally be thought of as embedded in the practices and protocols within an NGO that determine its advocacy choices.[6] The question is: If citizens have a particular set of tastes, what type of objective function must an NGO have to attract their support?

Section 4 concludes.

belief about hidden information as in a model with informed and uninformed players".

[5] EPA thought process: "If the social atmosphere is such that every revealed wrong-doer faces an enormous social penalty, then to maximise welfare we only need to catch and reveal wrong-doing with small probability".

[6] Major environmental advocacy groups are widely-understood to vary in how sensitive they are to business interests, which in turn shapes their demands (Yaziji and Doh (2009)).

2 Model

2.1 Setup

Consider an industry made up of a large number of firms. Each firm makes a binary decision to engage in behavior that is either 'good' ($a = 1$) or 'bad' ($a = 0$). For convenience we will use the terms compliance ($a = 1$) and non-compliance ($a = 0$) as equivalents, but that should be understood to have wider interpretation than satisfaction of some formal legal requirement. Compliance is costly for the firms with cost represented by c. Firms are heterogenous - they vary in how costly they find it to behave well - and c is distributed according to distribution function F with corresponding density function f. The firm knows the realized value c, but others know only the distribution F from which it is drawn. For simplicity we restrict attention to the case in which c is uniformly distributed on $[0, 1]$. The taxonomy that we develop turns out to be very rich, so it is unlikely that allowing for a more general distribution would deliver more insight.

There are two entities that between them determine the incentives facing firms to comply: an EPA and an NGO. These two "regulators" have different instruments and different objectives. Social penalties are jointly-produced by their actions. In general, the coercive tools available to it mean that the EPA has a comparative advantage in information gathering (through inspection programs, mandatory disclosure requirements, and so on) and NGOs in influencing community attitudes towards bad behavior. The relationship between the EPA and NGO is symbiotic. The NGO relies on the EPA to identify badly behaving firms. The EPA needs the NGO to use its influence to 'whip-up' public anger towards this particular type of bad behavior. The EPA and NGO understand that they are strategically interdependent and interact non-cooperatively. It is worth making explicit here that we do not analyse the case in which multiple NGOs co-exist and may compete (or collaborate) in pursuing their various objectives.

The EPA operates an information regime - which for shorthand we will call an inspection policy - which detects non-compliance with probability p. Inspection is costly for the EPA, with an associated cost function $\upsilon(p)$, where υ is increasing and convex in p and $\upsilon'(0) = 0$. To generate closed-form solutions of the game we will adopt a quadratic cost assumption; $\upsilon(p) = 1/2\alpha p^2$, with $0 < \alpha < 1$. In some settings if the EPA detects non-compliance the firm may have to pay a formal penalty or fine ψ. However these fines are often small and not in themselves sufficient to create enough "audit pressure" to motivate compliance among all firms. In order to focus on social or informal penalties, and the strategic interaction between the EPA and the NGO, we set $\psi = 0$, *i.e.* there is no penalty for non-compliance from the

EPA.

The assumption that $\psi = 0$ is worth reflecting on here. In many practical settings penalties that the EPA has at their disposal, while likely not zero, can be comparatively small, and certainly short of what would be needed to ensure full-compliance with the rules that they police. This will not apply, of course, in every industry or every jurisdiction. The assumption of restricted penalties is a fairly common one in the regulatory enforcement literature (for some important early examples see Harrington (1988), Heyes (1996), Heyes and Rickman (1999), Kambhu (1989)). It also motivates the practical and academic interest in community-imposed or informal regulatory penalties where formal penalties are sparse (Pargal and Wheeler (1996), Heyes and Kapur (2012)). Harrington (1988) outlines a series of justifications for assuming that penalties are restricted, often severely: "In most states there is a restriction on the size of penalty that can be levied ... (E)ven when a maximum fine is not imposed by statute there may be practical of political limits to the size of penalties. Sever but rarely imposed penalties might seem capricious and unfair." American readers should note that historically penalties have tended to be much more restricted outside the US. For example, Hawkins (1983) observes that: "The reference to the low level of sanction is made with the British position in mind. The American regulatory agency is armed with legal sanctions fearsome in comparison." (Hawkins (1983: 69)). Our assumption that EPA penalties are not just limited but zero is, of course, a stark one, and not realistic in most settings. However it maintains a sharp separation of powers between the EPA and NGO in our model which we believe to be helpful. In Heyes and Oestreich (2018), the online Appendix to this paper, we establish that relaxing this assumption has little impact on the qualitative results.

The NGO has no capacity to audit firms - it relies on information from the information-gathering endeavours of the EPA. However it is able to influence public opinion, that is create a negative reaction by social-minded citizens if the firm is shown to be out of compliance. This results in a negative payoff or social penalty to the firm denoted by θ. That social penalty is the financial value associated with the diminution of social license. But influencing public attitudes is costly for the NGO - it may have to run adverts, print leaflets, engage in educative and persuasive campaigns to sensitize people to the issue at hand. The size of the social penalty depends on the costly efforts by the NGO, reflected by cost function $\kappa(\theta)$, where κ is increasing and convex in θ and $\kappa'(0) = 0$. We will use the following quadratic cost function $\kappa(\theta) = 1/2\beta\theta^2$, with $0 < \beta < 1$, to ensure closed-form solutions. Variable β can be thought of as the society level of "alertness" towards NGO messaging. When β is small, a society is "alert" towards an issue and it is relatively cheap for the NGO to influence public attitudes; when β is large, a society is "inattentive" towards an issue and it is relatively expensive for the NGO to influence public attitudes. That NGO cost is assumed insensitive

to prevalence of non-compliance in the regulated population reflects our focus on the role of an NGO in inducing social contempt for a particular sort of behavior (such as drink driving, failure of a firm to pay minimum wage or to dispose of waste product legally), rather than against a particular non-compliance incident.

Firms and regulators move in sequence. At *stage one*, firms decide whether or not to comply with the standard. One can think of this as a firm making investment or product design decisions, adopting management practices, that are either good or bad for society. At *stage two*, EPA and NGO choose simultaneously the inspection probability and the social atmosphere into which the audit reports are published.[7]

Industry Consider a firm of type c. The payoff when complying with the standard is $\Pi(a = 1) = -c$, while the firm's payoff for non-compliance and instead facing the expected social penalty in case of detection is $\Pi(a = 0) = -p\theta$. Hence, a firm does comply if:

$$c \leq p\theta.$$

Figure 1 shows the cumulative distribution function $F(c)$ and the fraction of firms that will comply and those that will not comply with the standard. Given the uniform distribution of c, the probability that a firm complies is $\Pr(c \leq p\theta)$, i.e.: $F(p\theta) = p\theta$. Hence, the expected fraction of firms that comply is $p\theta$ and the expected fraction of firms that do not comply is $(1 - p\theta)$.[8]

*** Figure 1 here ***

[7] This seems to use the most natural sequence of events. In some setting it may be more appropriate to think of the EPA moving first and with commitment power. In Heyes and Oestreich (2018) we establish that modeling in this alternative way has almost no effect on the qualitative results of the analysis. We are grateful to a referee for encouraging us to test the robustness of results to this change.

[8] Lyon (2012) writes "Perhaps the most important reward offered by NGOs is public endorsement of a corporation's environmental actions through a partnership with that company. [..] Perhaps the most important harms wielded by NGOs are the threat of a consumer boycott of a firm's products and, more generally, the sullying of a firm's reputation in the media." In essence the model at hand captures the second, but not the first effect. However, consider the following extension: If audited and found to be in compliance, the firm benefits because the NGO has directed the public atmosphere accordingly. Thus, while θ represents the social penalty created by an NGO, a fraction of θ is added to the firm's profits in case to be found in compliance such as $\zeta\theta$, where $\zeta < 1$. The key inequality $c \leq p\theta$ describing industry behaviour would change to $c + p\zeta\theta \leq p\theta$ or $c \leq p\theta(1 - \zeta)$. The current model concentrates on the special case in which $\zeta = 0$.

EPA The EPA's objective is to minimize a social loss function W which comprises firms' compliance costs, the environmental damage associated with cases of non-compliance, the costs of the NGO and the costs of inspections.

Note, the costs c of all complying firms are in the interval $[0, p\theta]$ so that the firms' expected cost of compliance is the expected value of c in $[0, p\theta]$. That is,

$$\int_0^{p\theta} cf(c)dc.$$

The fraction of firms that do not comply $(1 - p\theta)$ cause social damage $D(.)$ which is increasing and convex. For tractability we assume quadratic damages; $D(.) = 1/2\gamma(1 - p\theta)^2$, with $0 < \gamma < 1$.

Putting all this together, the EPA chooses detection probability p in order to minimize the social loss function W:

$$\min_p W = -\int_0^{p\theta} cf(c)dc - 1/2\gamma(1 - p\theta)^2 - 1/2\beta\theta^2 - 1/2\alpha p^2. \tag{1}$$

In raising p the EPA trades-off the lower damages resulting from the higher number of firms in compliance against higher costs to the industry and higher enforcement cost. In the following, we focus on interior solutions. In the Nash outcome the EPA will take the social atmosphere θ created by the NGO as given. The first-order condition $\partial W/\partial p = 0$ is given by:

$$-p\theta^2 + \gamma\theta(1 - p\theta) - \alpha p = 0.$$

The first-order condition leads to the best-response function (BRF) for the audit rate p for any given social atmosphere θ chosen by the NGO:

$$p(\theta) = \frac{\theta\gamma}{\alpha + \theta^2(1 + \gamma)}. \tag{2}$$

We note in passing that a second order sufficient condition for a cost minimum $\partial W^2/\partial^2 p < 0$ is satisfied. Inspecting the best-response function of the EPA (2) leads to:

Proposition 1 *The audit rate p selected by the EPA is increasing in the severity of environmental damage γ and decreasing in the cost of inspection α. It is non-monotonic in the prevailing social atmosphere θ: If θ is small, an increase in it induces the EPA to increase*

inspection intensity (actions are strategic complements). If θ is large, an increase in it induces the EPA to decrease inspection intensity (actions are strategic substitutes).

The result that p is increasing in γ and it is decreasing in α is intuitive: The more severe the environmental damage associated with non-compliance γ the higher the audit rate p. In contrast, the more costly it is for the EPA to conduct audits, the lower the audit rate.

The impact of θ on p is interesting as it is non-monotonic as described by the Proposition. In fact, $p(\theta)$ has a maximum where $\partial p(\theta)/\partial\theta = 0$ which occurs at:

$$\overline{\theta} = \sqrt{\frac{\alpha}{1+\gamma}}.$$

That means, if the social penalty is relatively small, i.e.: $\theta < \overline{\theta}$, p is a strategic complement for θ and if the penalty is large, i.e.: $\theta > \overline{\theta}$, p is a strategic substitute for θ. Put differently: there are two offsetting impacts when the NGO increases θ. On the one hand, a larger θ increases the marginal effectiveness of information provision by the EPA. Because its instrument becomes more effective, the EPA may choose to use it more. On the other hand, increasing θ, means that the industry becomes subject to further scrutiny, which, at some point, may be too large from the point of view of the EPA. In that case, the EPA may contract its own efforts.

We will see below that the equilibrium value θ^* can be smaller or larger than $\overline{\theta}$. That means, the equilibrium actions of the EPA to the actions of the NGO can be strategic complements or strategic substitutes. This non-monotonicity turns out to have important implications for how keen the NGO will be to devote effort to developing a more hostile social atmosphere. Beyond some point it recognizes that its own efforts to generate harder incentives for good behavior are partly- or fully-offset by the induced *decrease* in the inspection intensity chosen by the EPA.

NGO The NGO cares about environmental quality and industry costs to various degrees. Certainly, NGOs vary in how "pure" green they are. Different NGOs place different weights on the bottom line of industries. Some environmental NGOs such as WWF and the Environmental Defense Fund, in designing their campaigns are understood to be sensitive to the business and economic implications of their actions. They emphasize collaboration and solutions that improve the environment and increase profits at the same time. Others such as Greenpeace and the Rainforest Action Network are a deeper green, with little or no regard for the financial implications that their actions might have on polluting sectors (Yaziji and Doh (2009) provide an excellent summary of the revealed operational objectives of a number of the most important environmental NGOs).

We operationalize this by saying that the objective function of an NGO is a weighted sum of environmental damage and compliance costs to the industry, but the NGO always *over*-weights environmental outcomes in comparison to the EPA (this is what makes it an environmental NGO). Finally, the NGO cares about its own campaigning cost. So for a given audit rate p the problem of the NGO is to choose social penalty θ in order to minimize the loss function Z:

$$\min_{\theta} Z = -\lambda \int_{0}^{p\theta} cf(c)dc - (1-\lambda)(1/2\gamma((1-p\theta))^2) - 1/2\beta\theta^2.$$

The parameter $\lambda \in [0, 1/2)$ is the weight on industry costs - a lower value of λ is associated with an NGO that places greater weight on environmental quality; in other words the NGO is 'deeper' green.[9] For some NGOs, $\lambda = 0$ which is the case when the NGO does not care about industry costs at all. For now we take that value as exogenous, later we explore how an NGO might wish to manipulate it strategically and instrumentally to further progress its goals.

In raising θ the NGO trades-off the reduced damages from the smaller number of firms in non-compliance against higher industry costs and higher enforcement cost. The first-order condition $\partial Z/\partial\theta = 0$ is given by:

$$-\lambda p^2\theta + (1-\lambda)\gamma p(1-p\theta) - \beta\theta = 0.$$

The first-order condition leads to the BRF for the social penalty θ for any given audit rate p chosen by the EPA:

$$\theta(p) = \frac{p\,(1-\lambda)\,\gamma}{\beta + p^2(\lambda + (1-\lambda)\,\gamma)} \tag{3}$$

We note in passing that a second order sufficient condition for a cost minimum $\partial Z^2/\partial^2\theta < 0$ is satisfied. Inspecting the best-response function of the NGO (3) leads to the following Proposition:

Proposition 2 *The social atmosphere implemented by the NGO is increasing in the severity of environmental damage γ and decreasing in the cost of inspection β and weight λ. It is*

[9] We thank two anonymous referees for the question of robustness of our main results when the EPA's cost factor into the NGO's loss function. One referee has noted that the modeling choices made with regard to the EPA and NGO objective functions introduce a particular type of asymmetry. While the EPA weighs the costs of the NGO, the NGO attaches no weight to the costs incurred by the EPA. While we retain this as our preferred specification in the body of the manuscript, we establish in Heyes and Oestreich (2018) that relaxing this assumption - assuming that the NGO internalize, to some extent, the costs of the EPA - has little impact on results.

non-monotonic in the intensity of the EPA's inspection intensity: If p is small, an increase in it induces the NGO to increase social penalty (actions are strategic complements). If p is large, an increase in it induces the NGO to reduce the social penalty (actions are strategic substitutes).

These results deliver the best-response function of the NGO. The social penalty θ is increasing in the severity of damage γ and it is decreasing in the cost of auditing β and weight λ. The intuition is straight-forward: the more costly it is for the NGO to create the social penalty or the more the NGO cares about the bottom line of firms, the lower the created social penalty. Also, the more severe the damages from non-compliance γ the higher the social penalty θ.

The impact of p on θ is interesting as it is non-monotonic as described by the Proposition. In fact, $\theta(p)$ has a maximum where $\partial\theta(p)/\partial p = 0$, which is equivalent to:

$$\overline{p} = \sqrt{\frac{\beta}{(\lambda + (1-\lambda)\gamma)}}.$$

We will see below that the equilibrium value p^* can be smaller or larger than $\overline{p}$. That means, the equilibrium actions of the EPA can be strategic complements or strategic substitutes. In other words, if the audit rate is relatively small, i.e.: $p < \overline{p}$, θ is a strategic complement for p and if the audit rate is large, i.e.: $p > \overline{p}$, θ is a strategic substitute for p. Put differently: there are two offsetting impacts when the EPA increases p. On the one hand, a larger p increases the marginal effectiveness of social penalization by the NGO. Because its instrument becomes more effective, the NGO may choose to use it more. On the other hand, increasing p, means that the industry becomes subject to further scrutiny, which, at some point, may be too large even from the point of view of the NGO (unless $\lambda = 0$). In that case, the EPA may contract its own efforts.

2.2 Taxonomy of Strategies

The Nash Equilibrium (NE) occurs where the two best-response functions of the EPA (2) and the best-response function of the NGO (3) intersect, i.e. at the equilibrium, there is no incentive to deviate for either entity.

*** Figure 2 here ***

Figure 2 illustrates the NE p^* and θ^* and the maxima of the two best-response functions $\overline{p}$ and $\overline{\theta}$ respectively. We can anticipate that the signs of the slopes of the respective players' reactions functions are likely to dictate the properties of any particular NE, so it is natural to let the maxima of the best-response functions (which we will denote $\overline{p}$ and $\overline{\theta}$) partition the action set of EPA and NGO into four quadrants. Depending on context - as described by different constellations of parameters - the NE may occur in quadrant I, II or III based on parameter values. We are able to rule out the possibility that it occurs in quadrant IV. In section IV the EPA actions are strategic complements and the NGO actions are strategic substitutes. However, given that the NGO overweights environmental interests it can never be optimal for the NGO to decrease activities (when EPA increases its own activities) in a situation where EPA would increase activities (when NGO increases its activities).

In the case illustrated in Figure 2, for example, the NE is in section III. Here, the actions of the NGO are strategic complements in the vicinity of equilibrium. That means, the more the EPA audits the firms (increasing p), the higher the NGO chooses the social penalty θ to be (the more heavily it invests in whipping up community hostility). Equally, if the NGO increases θ, the EPA response with increasing p. Table 1 shows the other possible strategy combinations of EPA and NGO that could occur in equilibrium.

The policy relevance of these segments can be explained through situations of relative strength and/or weakness of NGO and/or EPA. For instance, sections I and II are reflective of the situation in some developing countries. In these sections, the efforts of a well-funded international NGO have come to be more important than governmental enforcement efforts. INECE (2005) states: "NGOs, particularly the better-funded international NGOs, run the risk of outpacing government efforts in countries where there is limited government capacity for enforcement and compliance, and this may present diplomatic problems when governments consider NGOs as competitors rather than collaborators."

Section	EPA Actions	NGO Actions
I	strategic substitutes	strategic complements
II	strategic substitutes	strategic substitutes
III	strategic complements	strategic complements
IV	not feasible in equilibrium	

Table 1: Taxonomy of strategies

The intuition contained in the taxonomy is relevant for EPA and NGO decision makers alike. Even if they do not have in mind a formal model of the sort presented here, in making its decisions about how much effort to expend on encouraging a hostile social atmosphere a well-functioning NGO should have regard not just to the direct effect on firms, but also to the induced effect on the behavior of the EPA. The efficacy of its own actions may be off-set (for example) if the EPA responds by scaling back the intensity of its own information-provision efforts. Indeed, this is the case if the equilibrium occurs in sections I and II. In other circumstances (section III) the EPA will be induced to *expand* that intensity, and the NGO will be motivated to push even harder to exploit such crowding-in effects. In parallel the NGO, as a strategic actor in its own right, will realize that the intensity of the information provision program that it operates will influence the incentive that the NGO has to invest in a hostile community atmosphere.

The taxonomy also allows us to think systematically about the comparative static impacts of changing various parameters. For instance, consider a change in the preferences of the NGO in terms of λ, i.e. how much the NGO cares about environmental costs in comparison to industry cost. We know from the analysis of the best-response functions (BRFs) that the NGO's BRF is decreasing in λ, while the EPA's BRF is not affected by λ. Referring to Figure 1 we can infer e.g. how the equilibrium outcomes change when the NGO internalizes more/less of industry costs. If the compliance atmosphere is reflected by a NE in sections I and II, the more the NGO cares about industry profit, the less social penalty it will create but the more intensively will the EPA audit in equilibrium. In contrast, if the NE is in quadrant III, the more the NGO cares about industry profit, the less social penalty it will create, and the less the EPA will audit.

2.2.1 Equilibrium

In this section, we derive the closed-form solution to the above game between the EPA and the NGO when both regulators behave non-cooperatively. The solution is found by inverting the two best-response functions (2) and (3).

Proposition 3 *The solution to the game between the EPA and the NGO is:*

$$p^* = \sqrt{-\frac{1}{\alpha\left(\lambda+\gamma-\lambda\gamma\right)^2}\left(-A(1-\lambda)+\gamma^2(\frac{1}{2}+\lambda^2-\frac{3}{2}\lambda)+\alpha\beta(\lambda+\gamma-\lambda\gamma)\right)},$$

$$\theta^* = \sqrt{\frac{1}{\beta\left(\gamma+1\right)^2}\left(A+\gamma^2(\frac{1}{2}-\lambda)-\alpha\beta(1+\gamma)\right)},$$

where

$$A = \gamma\sqrt{\frac{1}{4}\gamma^2+\lambda^2\gamma^2-\lambda\gamma^2+\alpha\beta\gamma^2+\alpha\beta\lambda+\alpha\beta\gamma-\alpha\beta\lambda\gamma^2}.$$

Special Case For tractability, we restrict our attention to one special case of the general model above. Since our primary focus here is on the characteristics and behaviors of the NGO we will hold constant the level of environmental damages at $\gamma = 1$ and EPA costs at $\alpha = 1/2$. We continue to capture the cost of the NGO as $0 < \beta < 1$ so that we still analyse relevant situations where EPA cost is relatively larger or smaller than EPA cost depending on the atmosphere in the society towards a particular social issue.

For this special case, the solution simplifies to:

$$p^* = \sqrt{3\lambda-\beta-2\lambda^2+B(1-\lambda)-1}, \tag{4}$$

$$\theta^* = \frac{1}{2}\sqrt{-\frac{1}{\beta}\left(\beta+\lambda-\frac{1}{2}B-\frac{1}{2}\right)}, \tag{5}$$

where:

$$B = \sqrt{4\lambda^2-4\lambda+4\beta+1.}$$

The maximum points in the respective best-response functions are given by:

$$\overline{p} = \sqrt{\beta} \text{ and } \overline{\theta} = 1/2.$$

It is important to note that p^* can be larger or smaller than $\overline{p}$ and that θ^* can be larger or smaller than $\overline{\theta}$ depending on parameter values as per our next proposition.

Proposition 4 *We have:*

$$\begin{cases} p^* > \overline{p} & if \quad \beta < \lambda(1-\lambda) \quad and \quad p^* \leq \overline{p} \quad otherwise; \\ \theta^* > \overline{\theta} & if \quad \beta < 3/4 - \lambda \quad and \quad \theta^* \leq \overline{\theta} \quad otherwise. \end{cases}$$

We note that $\lambda(1-\lambda) < 3/4-\lambda$ holds true as per our definition of the NGO ($\lambda < 1/2$). Thus, if $\beta < \lambda(1-\lambda)$, the equilibrium is in section II; if $\lambda(1-\lambda) < \beta < 3/4-\lambda$, the equilibrium is in section I; and if $3/4-\lambda < \beta$ the equilibrium is in section III of the proposed taxonomy.

The Proof is in the Appendix.

In the vicinity of equilibrium the actions of the EPA and NGO can be strategic substitutes or strategic complements. It is interesting to observe how the equilibrium values for auditing p^* and social penalty θ^* change in relation to $\overline{p}$ and $\overline{\theta}$ when varying the exogenous parameters of the model. For instance, for fixed positive λ, when β is small ($\beta < \lambda(1-\lambda)$), the equilibrium is in section II ($p^* > \overline{p}$ and $\theta^* > \overline{\theta}$). That means, the equilibrium actions of EPA and NGO are both strategic substitutes. As β increases, the equilibrium changes location *counterclockwise* (referring to Figure 2) from section II to section I ($p^* < \overline{p}$ and $\theta^* > \overline{\theta}$) if β is moderate ($\lambda(1-\lambda) < \beta < \frac{3}{4} - \lambda$) and finally to section III ($p^* < \overline{p}$ and $\theta^* < \overline{\theta}$) for large values of β ($3/4-\lambda < \beta$). That means, always when β decreases, the use of θ increases which is intuitive. Lower cost to stir-up public anger results in doing so more. The strategic response from the EPA depends on the section the equilibrium is situated in. In section I and II, increasing θ is responded with decreasing p (the NGO crowds-out EPA activity) and in section III increasing θ is responded with increasing p (the NGO crowds-in EPA activity). Table 2 summarizes these insights.

	$\beta > \lambda(1-\lambda)$	$\beta < \lambda(1-\lambda)$
$\beta < 3/4 - \lambda$	Section I $p^* < \overline{p}$ $\theta^* > \overline{\theta}$	Section II $p^* > \overline{p}$ $\theta^* > \overline{\theta}$
$\beta > 3/4 - \lambda$	Section III $p^* < \overline{p}$ $\theta^* < \overline{\theta}$	not feasible

Table 2: Possible equilibria depending on β and λ.

There are three distinct regulatory environments based on how costly the NGO finds it to stir-up public anger given the social atmosphere towards the particular issue (captured by parameter $\beta \in (0,1)$) and by how much the NGO cares about the bottom line of firms (captured by parameter $\lambda \in [0, 1/2)$). Small β means it is rather easy for the NGO to motivate society to levy a public penalty to a non-complying firm. We call such a society "alert". On the contrary, large β means it is rather difficult for the NGO to motivate society to levy a public penalty to a non-complying firm. We call such a society "inattentive". We call a society "attentive" if it is neither alert nor inattentive. In a stylized way the reader may think of how likely a recipient of a leaflet or other message from an NGO is to read it, and therefore how intensive a communication program the NGO has to mount in order to 'get its message across'. Furthermore, we call the NGO to be "green" if λ is relatively small, that is the NGO cares very little about the bottom line of firms but instead it is only concerned with the cause. We call the NGO "business-friendly" if λ is relatively large, that is the NGO cares considerably about the bottom line of firms and about the cause. Figure 3 illustrates the behavior of EPA and NGO based on λ and β.

*** Figure 3 here ***

Our taxonomy delivers several new insights, as "real-world" regulatory contexts can plausibly be sorted into the taxonomy outlined in Figure 3.

To take a couple of examples, if society is sufficiently inattentive ($\beta > 3/4$), the equilibrium is necessarily situated in section III, where more EPA activity is responded by more NGO activity and vice versa more NGO activity induces more EPA activity. This is reflective of "real-world" situations where EPAs and NGOs are "partners for the cause". If society

is very attentive about the issue and the NGO is very green, the equilibrium tends to be in section I, where more EPA activity induces more NGO activity, but more NGO activity causes a reduction in EPA activity. This is reflective of "real-world" situations in some developing nations where EPAs and NGOs are "opponents" in that the EPA would rather hinder the work of the more "radical" (hostile to business) NGO. Other cases can be read off and interpreted analogously.

3 Strategic Delegation: The Optimal NGO Chief

An interesting feature that the taxonomy makes transparent is that outcomes - both environmental, and equilibrium efforts by state regulator and NGO - are sensitive to the NGOs objective function. In particular to λ, the relative weight placed on environmental versus economic cost impacts, or how business-burden-sensitive (brown) the NGO is in its decision-making.

This leads naturally to the following question: If I am to delegate my advocacy to an NGO (say through donation), what sort of objective function would I want it to have in order to best progress my preferred outcomes?

The leadership of NGOs include former CEOs of companies or global civic leaders - perhaps in executive functions, or perhaps on boards of control. In exercising discretion they can be expected to vary in how they trade-off business and economic interests against environmental outcomes. That is the leadership of an NGO can vary in how deep a shade of green it is in the way in which it makes operational decisions. A forward-looking NGO donor can reasonably be expected to account for such strategic considerations when deciding how to assign donations. We will show that such a NGO donor typically prefers a delegate with a λ *different* to his or her own.[10] We could alternatively think of a single large founder (Bill Gates) about to give a million dollars to a green foundation but setting the rules/byelaws/board composition of the foundation first. For the rest of this section we will talk of a single donor, but the distinction is semantic.

If the true tastes or objectives of the donor are described by λ^{true}, what sort of chief would they want running the NGO (which we will denote λ^{del})? The objective of a founder with

[10] Or equivalently: an NGO that has "designed into" its processes and practices that embody a particular weighting of business interests. The strategic delegation story is most associated with the conservative central banker analysis of Rogoff (1985). In a setting in which society - or the government in power - attached particular weights to inflation versus employment outcomes he noted that "Society can often make itself better off by appointing a central banker who does not share the social objective function, but instead places 'too large' a weight on inflation relative to unemployment" (Rogoff (1985: 1169)). In the spirit of Rogoff's conclusion, a single or population of donors to green causes may find their objectives better served by donating to an NGO that attached different weights to the environment/business trade-off than they do themselves.

true objective captured by λ^{true} is to choose λ^{del} to maximize

$$Z(\lambda^{del}|\lambda^{true}, \beta, p^*(\lambda^{del}), \theta^*(\lambda^{del})) = -\lambda^{true}(1/2)p^2\theta^2 - (1-\lambda^{true})1/2(1-p\theta)^2 - 1/2\beta\theta^2$$

with equilibrium actions of EPA p^* and NGO θ^* themselves depending on λ^{del}.

Using $p^*(\lambda^{del})$ from (4) and $\theta^*(\lambda^{del})$ from (5) and deriving $\partial Z/\partial\lambda^{del} = 0$ given λ^{true} (first-order condition) implicitly defines the mapping from λ^{true} to λ^{del}. The resulting function $\lambda^{del}(\lambda^{true})$ is complex and we investigate some of its relevant characteristics in the Appendix. Based on this investigation, we gain the following insights.

Recall first, that a truly green NGO donor features $\lambda^{true} = 0$. The next proposition establishes the link between λ^{true} and λ^{del} for a truly green NGO donor.

Proposition 5 *A deep green donor (one with tastes described by $\lambda^{true} = 0$) will delegate to an NGO chief with the same tastes as herself ($\lambda^{del} = 0$) if society is sufficiently inattentive, in particular if $\beta \geqq 3/4$. She delegates to one less green than herself ($\lambda^{del} > 0$) if society is sufficiently alert ($\beta < 3/4$).*

The Proof is in the Appendix.

When a green donor ($\lambda^{true} = 0$) truthfully delegates $\lambda^{del} = 0$ and society is sufficiently alert ($\beta < 3/4$), the equilibrium occurs in section I of the Taxonomy of Strategies of EPA and NGO. In section I the EPA actions are strategic substitutes: *less* NGO activity induces *more* EPA activity. In this situation, it is optimal for the donor to delegate to an NGO chief who is more business-friendly than the donor, $\lambda^{del} > 0$. This is because the best-response function of the NGO $\theta(p)$ is decreasing in λ^{del} which is strategically responded by the EPA with increasing p (which in turn helps to achieve the objective of the green NGO). Thus, the increase in EPA efforts partially offsets the decrease in NGO efforts while the NGO saves costly resources. Put differently, in this setting the truly green NGO donor exploits the strategic setting by delegating to an NGO chief that is more business friendly than the donor.

When a truly green NGO donor ($\lambda^{true} = 0$) truthfully delegates $\lambda^{del} = 0$ and faces a society that is inattentive towards the issue ($\beta \geqq 3/4$), the equilibrium occurs in section III of the Taxonomy of Strategies of EPA and NGO. In section III both the EPA actions and the NGO actions are strategic complements: *less* NGO activity is responded by *less* EPA activity. In this situation, it is optimal for the NGO donor to delegate sincerely (appoint an NGO chief with the same preferences as the donor). In other words $\lambda^{del} = 0$, the NGO chief will not be business-friendly. In order to understand the intuition behind this result, we observe that if

the founder were instead to delegate some $\lambda^{del} > 0$ the best-response function of the NGO $\theta(p)$ would decrease leading to lower θ *and* lower p in equilibrium, contrary to the founder's ultimate objective.

Next, note that a "business-friendly" NGO donor features $\lambda^{true} \to 1/2$ (λ is marginally lower than $1/2$). The next proposition establishes the link between λ^{true} and λ^{del} for a business-friendly NGO donor.

Proposition 6 *A business-friendly donor (one with tastes described by $\lambda^{true} \to 1/2$) will delegate to an NGO chief with the same tastes as herself ($\lambda^{del} \to 1/2$) if society is sufficiently alert ($\beta < 1/4$). She delegates to one more green than herself ($\lambda^{del} < 0$) if society is attentive or inattentive ($\beta \geqq 1/4$).*

The Proof is in the Appendix.

We note that a business-friendly NGO donor still overweighs environmental over business outcomes compared to the EPA. Such a donor is also interested to free-ride on EPA efforts which are free of charge to the NGO. Thus, the donor uses strategic delegation to crowd-in EPA efforts whenever suitable.

When a business-friendly founder ($\lambda^{true} \to 1/2$) truthfully delegates $\lambda^{del} \to 1/2$ and society is sufficiently alert ($\beta < 1/4$), the equilibrium occurs in section II of the Taxonomy of Strategies of EPA and NGO. In section II the EPA actions are strategic substitutes: *more* NGO activity induces *less* EPA activity. In this situation, it is optimal for the donor to delegate sincerely (appoint an NGO chief who's tastes replicate the ones of the donor). In other words $\lambda^{del} \to 1/2$, the NGO chief will also be business-friendly. To see why we can observe that if the business-friendly founder were instead to delegate a more green mission ($\lambda^{del} < 1/2$), NGO activity θ would increase and subsequently EPA activity p would decrease which is contrary to the objective of the NGO founder.

When a business-friendly founder ($\lambda^{true} \to 1/2$) truthfully delegates $\lambda^{del} \to 1/2$ and society is sufficiently inattentive ($\beta \geqq 1/4$), the equilibrium occurs in section III of the Taxonomy of Strategies of EPA and NGO. In section III both the EPA actions and the NGO actions are strategic complements: *more* NGO activity is responded by *more* EPA activity. In this situation, it is optimal for the NGO donor to delegate a more green mission. This would result in increasing NGO activity and also in increasing EPA activity. Again the NGO donor free-rides on EPA efforts and strategically crowds-in EPA efforts.

Until now, we have focused on two special cases in terms of NGO characteristics: (i) $\lambda^{true} = 0$ and (ii) $\lambda^{del} \to 1/2$. Next, we analyze more general cases of λ^{true}. Figure 4 illustrates the complete mapping from λ^{true} to λ^{del}, i.e. the function $\lambda^{del}(\lambda^{true})$ for various levels of β.

*** Figure 4 here ***

The mapping of the true NGO type into the delegated type $\lambda^{del}(\lambda^{true})$ is insightful. We observe from Figure 4 that a sufficiently green NGO donor (small λ^{true}) who faces a sufficiently alert society (small to medium β) delegates to a more business friendly (brown) NGO chief. The NGO donor does this in order to crowd-in EPA activity as the equilibrium is in sections I or II. The NGO donor delegates to be more brown and subsequently lowers θ which saves the NGO costly resources while the EPA increases its activity which helps to achieve the true objective of the NGO. We note that the smaller β the larger tends to be the difference between λ^{del} and λ^{true}.

We also observe from Figure 4 that a sufficiently brown NGO donor (large λ^{true}) who faces an inattentive or attentive society (medium to large β) delegates more green missions. The NGO donor does this in order to crowd-in EPA activity as the equilibrium is in sections III. The NGO donor delegates to be more green and subsequently increases θ which is responded by EPA increasing her activity which helps to achieve the objective of the NGO. We note that the smaller β the larger tends to be the difference between λ^{del} and λ^{true}.

*** Figure 5 here ***

The outcomes from the mapping of λ^{true} to λ^{del} can also be illustrated with the help of the framework of our regulatory taxonomy introduced above. Figure 5 shows that all NGO donors which face an inattentive society ($\beta \geqq 3/4$) delegate a more green mission. The same is true for brown NGO donors facing an attentive or inattentive community. The NGO does this in order to crowd-in EPA activity as the equilibrium is in section III. The donor delegates in such a way as to be *less* business-friendly and subsequently *increases* θ which cost the NGO resources, but there is some leverage for these resources. This is because the increase in θ encourages the EPA to increase its activity in turn - due to strategic complementarity in this range - which further contributes to the true objective of the NGO donor. In other words, if the NGO has high cost of causing public anger, delegation is always to a deeper green mission. We further find that the larger β the more green is the delegated mission.

Note that there are moderate levels of β (i.e.: $\beta = 1/2$) where a relatively green NGO donor ($\lambda^{true} < 1/4$) delegates to a browner-than-self NGO chief; a relatively brown NGO founder ($\lambda^{true} > 1/4$) delegates to a greener-than-self NGO chief. In each case, the NGO founder uses strategic delegation to commit to being "more moderate".

Another interesting element of Figure 5 is the "truthful-delegation-envelope." Along this envelope, the NGO donor hires an NGO chief who has tastes that coincide with her own.

For instance, a brown NGO donor ($\lambda^{true} \to 1/2$) hires an equally brown chief ($\lambda^{del} \to 1/2$) if society is relatively alert ($\beta \leq 1/4$). Everywhere else, optimal delegation is strategic in character.

4 Conclusions

When a donor - big or small - gives money to an environmental NGO she is in effect delegating her advocacy 'bidding' to that NGO. It is therefore natural to ask what sort of surrogate the donor wants to act in his or her stead. This paper shows that NGO donors typically want to delegate their bidding to an NGO which trades-off business versus environmental outcomes differently in comparison to themselves.

Social pressure upon firms is determined endogenously in the model that we have developed, and is *jointly* produced between a state regulator and an NGO. Recognizing this coproduction of social pressure by different actors with different instruments and different objectives turns out to be critical to understanding the incentives for good corporate behavior that will emerge. In our stylized set-up the interactions between the EPA and civil NGO turn out to be complex and nuanced. Reflecting this we develop a taxonomy of social enforcement settings into which real-world environmental regulatory contexts can in principal be categorized. Central to the analysis is that each player recognizes and anticipates the impact of their own behaviors on the behavior of their coproducer. An NGO will have little interest in investing more effort to whip-up public angst, for example, if the EPA responds to that extra effort by scaling back the intensity of its own information-provision. Its pressure-generating efforts would, in that case, be off-set or 'crowded out' by the induced reaction. Equally a welfare-motivated public actor will be sensitive to the virulence of the social atmosphere into which it disseminates information.

We illustrate how the taxonomy can be used to shed light on the important phenomena of strategic delegation, and the leadership of NGOs that advocacy donors will find attractive.[11] In particular, how *hostile to* or *collaborative with* business will a donor want the NGO to be? To borrow the terminology that is the organizing theme of Lyon's (2012) book - should she or he appoint a good cop or bad cop?

How should we interpret the model? It is not clear that those that select NGO leaders, or that donors who decide to which NGOs to donate to, will contemplate first-order conditions

[11] As already noted there is a literature on strategic delegation by profit-motivated firm owners to managers with non-profit-maximising intent (for examples Vickers (1985), Fershtman and Judd (1987)). Research in that area goes further in considering a wider set of 'personality attributes' (aggressiveness, resilience, stubbornness, and so on) that the principal might find attractive in his agent. For a seminal empirical examination of this sort see Miller and Toulouse (1986).

and taxonomy diagrams of the sort presented here. However it *is* plausible to think that over time those NGOs - or NGO leaders - that best deliver outcomes favorable to the preferences of donors would come to flourish. Indeed it would be straight-forward to develop a model with plausible evolutionary or 'efficiency-seeking' properties in which the type of NGO leader with the preferred λ^{del} would 'rise to the top'. That preferred λ^{del} for a given underlying or true set of tastes is what we have characterized here. Developing some empirical insight - either from statistical data or case study analyses - is an important ambition of future research. Importantly the solutions have regard to the strategic interdependence that quite obviously exists between the pressure-generating actions of the state agency and that of civil society organizations, which has been ignored in existing work. The analysis provides a framework within which to think about how the state and the donor contributions influence the incentives for environmental and social good practice.

There are various ways in which the analysis might usefully be extended. One would be to provide a more explicit micro-foundation to how exactly the NGO generates social penalty. A second would be to allow for the coexistence of multiple NGOs with perhaps competing objectives. A third would be to consider, in a repeated setting, the role that reputation might play in insulating firm's found to be behaving badly from subsequent social sanction.

5 Appendix

5.1 Proof of Proposition 4

First, $\theta^* > \overline{\theta}$ is equivalent to condition $\frac{\partial p(\theta)}{\partial \theta} < 0$ evaluated at equilibrium. The BRF (with $\alpha = 1/2$ and $\gamma = 1$) is:

$$p(\theta) = 2\frac{\theta}{4\theta^2 + 1}$$

and the relevant derivative is:

$$\frac{\partial p(\theta)}{\partial \theta} = -2\frac{4\theta^2 - 1}{(4\theta^2 + 1)^2}.$$

Condition $\frac{\partial p(\theta)}{\partial \theta} < 0$ can only hold if $4\theta^2 - 1 > 0$ which is equivalent to:

$$\begin{aligned}
-\frac{1}{2\beta}\left(4\beta + 2\lambda - \sqrt{4\lambda^2 - 4\lambda + 4\beta + 1} - 1\right) &> 0 \\
4\beta + 2\lambda - \sqrt{4\lambda^2 - 4\lambda + 4\beta + 1} - 1 &< 0 \\
4\beta + 2\lambda - 1 &< \sqrt{4\lambda^2 - 4\lambda + 4\beta + 1} \\
(4\beta + 2\lambda - 1)^2 &< 4\lambda^2 - 4\lambda + 4\beta + 1 \\
16\beta^2 + 2(4\beta)(2\lambda - 1) + (2\lambda - 1)^2 &< 4\lambda^2 - 4\lambda + 4\beta + 1 \\
16\beta^2 + 2(4\beta)(2\lambda - 1) + (2\lambda - 1)^2 - 4\lambda^2 + 4\lambda - 4\beta - 1 &< 0 \\
4\beta\left(4\beta + 4\lambda - 3\right) &< 0 \\
4\beta + 4\lambda - 3 &< 0 \\
\beta + \lambda &< 3/4 \\
\beta &< 3/4 - \lambda.
\end{aligned}$$

Second, $p^* > \overline{p}$ is equivalent to condition $\frac{\partial \theta(p)}{\partial p} < 0$ evaluated at equilibrium. The BRF is:

$$\theta(p) = \frac{p(1 - \lambda)}{p^2 + \beta}$$

and the relevant derivative is:

$$\frac{\partial \theta(p)}{\partial p} = \left(\beta - p^2\right)\frac{(1 - \lambda)}{(p^2 + \beta)^2}.$$

Condition $\frac{\partial\theta(p)}{\partial p} < 0$ can only hold if $\beta - p^2 < 0$ which is equivalent to

$$\begin{aligned}
\beta - (3\lambda - \beta - 2\lambda^2 + B(1-\lambda) - 1) &< 0 \\
2\beta - 3\lambda + 2\lambda^2 - B(1-\lambda) + 1 &< 0 \\
2\beta - 3\lambda + 2\lambda^2 + 1 &< B(1-\lambda) \\
(2\beta - 3\lambda + 2\lambda^2 + 1)^2 &< B^2(1-\lambda)^2 \\
(2\beta - 3\lambda + 2\lambda^2 + 1)^2 &< (4\lambda^2 - 4\lambda + 4\beta + 1)(1-\lambda)^2 \\
(2\beta - 3\lambda + 2\lambda^2 + 1)^2 - (4\lambda^2 - 4\lambda + 4\beta + 1)(1-\lambda)^2 &< 0 \\
4\beta\left(\lambda^2 - \lambda + \beta\right) &< 0 \\
\lambda^2 - \lambda + \beta &< 0 \\
\lambda(1-\lambda) &> \beta
\end{aligned}$$

Third, we note that $\frac{3}{4} - \lambda > \lambda(1-\lambda)$ is true because $\lambda < 1/2$.

5.2 Proof of Proposition 5 and Proposition 6

The objective of a founder with true objective captured by λ^{true} is to choose λ^{del} to maximize:

$$Z(\lambda^{del}|\lambda^{true}, \beta, p^*(\lambda^{del}), \theta^*(\lambda^{del})) = -\lambda^{true}(1/2)p^2\theta^2 - (1-\lambda^{true})1/2(1-p\theta)^2 - 1/2\beta\theta^2$$

with equilibrium actions of EPA p^* and NGO θ^* themselves depending on λ^{del}.

Using $p^*(\lambda^{del})$ from (4) and $\theta^*(\lambda^{del})$ from (5) and deriving $\partial Z/\partial\lambda^{del} = 0$ given λ^{true} implicitly defines the mapping from λ^{true} to λ^{del}. The resulting function $\lambda^{del}(\lambda^{true})$ is complex and we investigate some of its characteristics in two main steps effectively proofing Proposition 5 and Proposition 6.

First, we note that it is not possible to isolate $\partial Z/\partial\lambda^{del} = 0$ for λ^{del} depending on λ^{true}, but alternatively it is possible to isolate for λ^{true} depending on λ^{del}, that is $\lambda^{true}(\lambda^{del})$, which is the inverse of the function of interest. The next Figure illustrates this inverse function $\lambda^{true}(\lambda^{del})$ for some example values of β: for $\beta \to 0$ (lower envelope), for $\beta \to 1$ (upper envelope) and also for $\beta = \{1/4, 1/2, 3/4\}$.

*** Figure 6 here ***

Second, we investigate function $\lambda^{del}(\lambda^{true})$ more generally (β not specified) at particular values for λ^{true}: (a) at $\lambda^{true} = 0$ and (b) at $\lambda^{true} \to 1/2$.

(a) We evaluate condition $\partial Z/\partial\lambda = 0$ restricted for $\lambda^{true} = \lambda^{del} = 0$. We find that this condition is solely solved by $\beta = 3/4$. From the examples above we know that $\lambda^{del}(\lambda^{true}) > 0$ if $\beta < 3/4$ and that $\lambda^{del}(\lambda^{true}) < 0$ if $\beta > 3/4$. Thus, a green NGO founder ($\lambda^{true} = 0$) truthfully delegates to be green ($\lambda^{del} = 0$) if NGO costs are relatively high ($\beta \geqq 3/4$). And the same NGO founder delegates to be more business-friendly ($\lambda^{del} > 0$) if NGO costs are relatively low ($\beta < 3/4$). This proves Proposition 5.

(b) We evaluate condition $\partial Z/\partial\lambda = 0$ restricted for $\lambda^{true} = \lambda^{del} = 1/2$. We find that this condition is solely solved by $\beta = 1/4$. From the examples above we know that $\lambda^{del}(\lambda^{true}) > 0$ if $\beta < 1/4$ and that $\lambda^{del}(\lambda^{true}) < 0$ if $\beta > 1/4$. Thus, a business-friendly NGO founder ($\lambda^{true} \to 1/2$) truthfully delegates to be business-friendly ($\lambda^{del} \to 1/2$) if NGO costs are relatively high ($\beta \geqq 1/4$). And the same NGO founder delegates to be more green ($\lambda^{del} > 0$) if NGO costs are relatively low ($\beta < 1/4$). This proves Proposition 6.

The insights above allow to derive Figure 4 for $\lambda^{del}(\lambda^{true})$ in the main paper.

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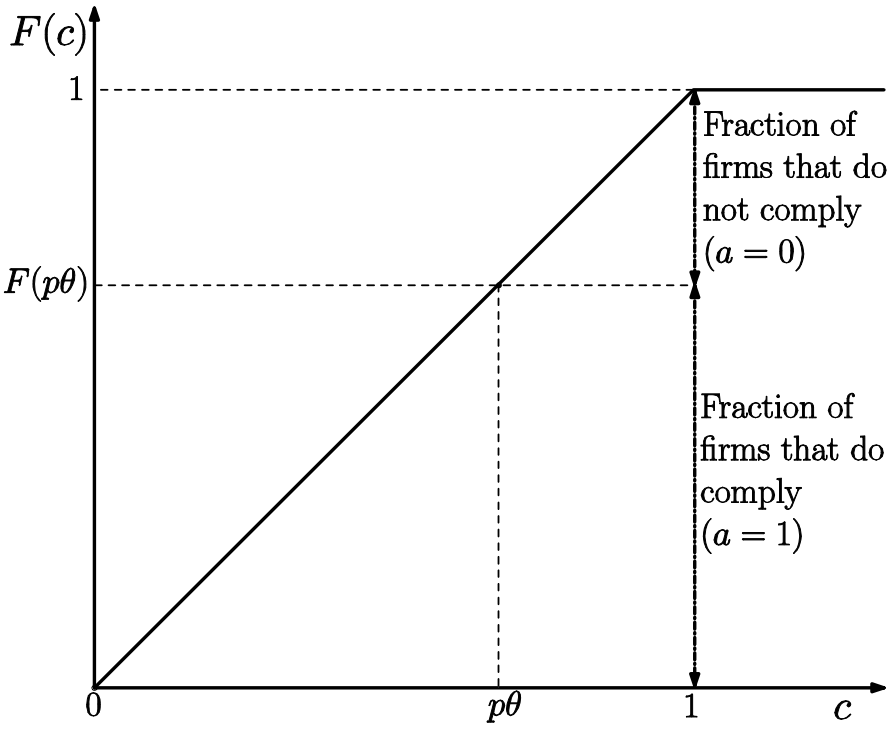

Figure 1: Cumulative distribution function of compliance cost c

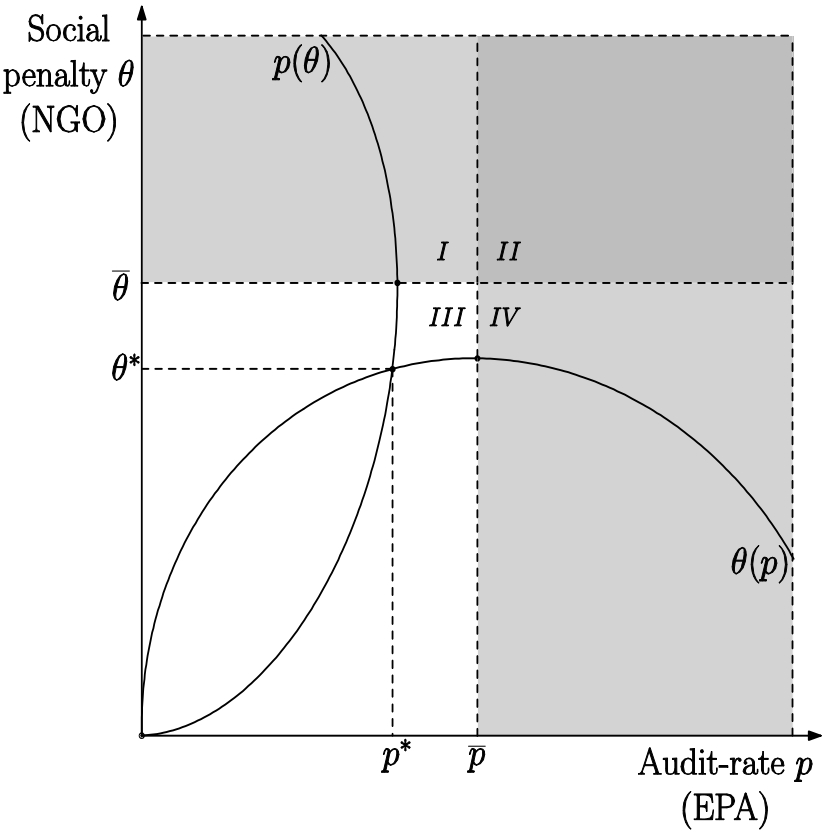

Figure 2: Taxonomy of strategies based on the best-response functions of EPA and NGO

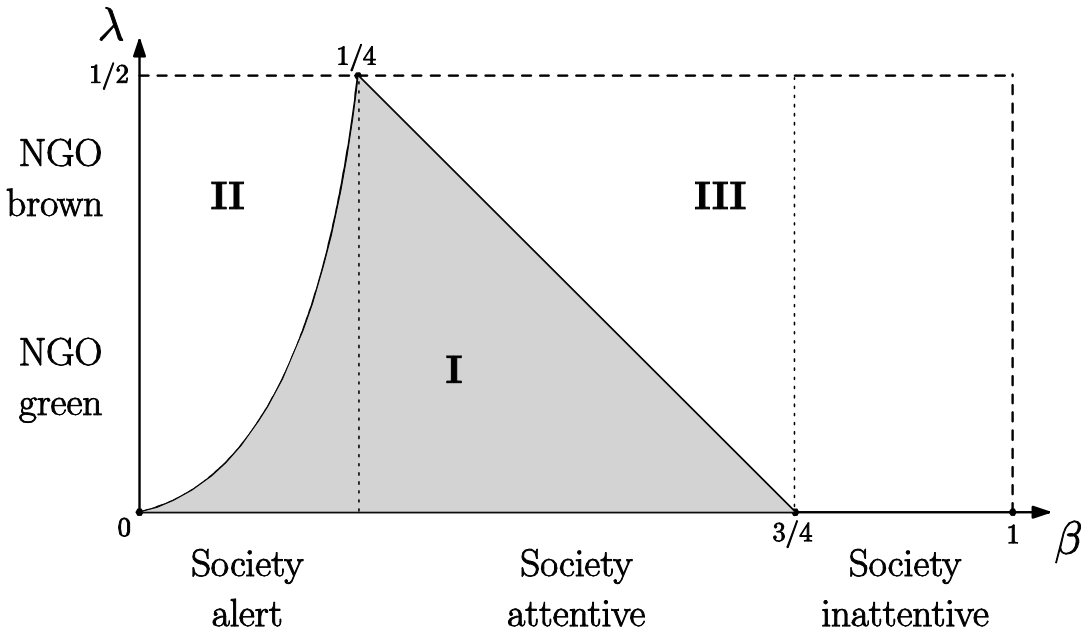

Figure 3: Taxonomy of regulatory environments

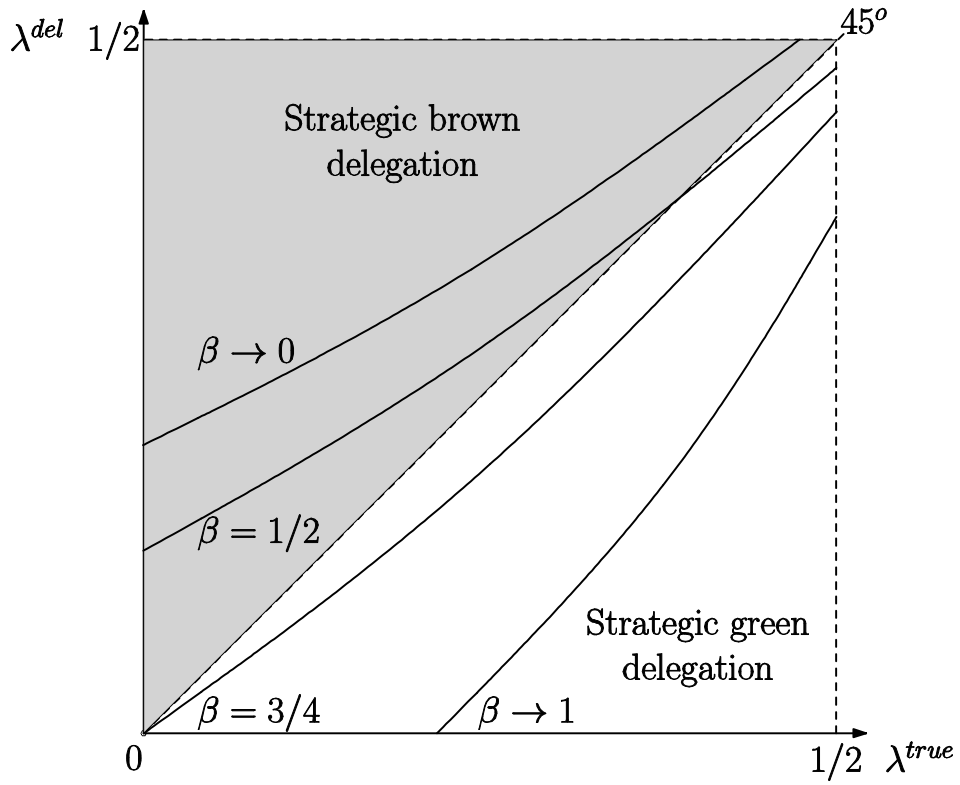

Figure 4: Function $\lambda^{del}(\lambda^{true})$ for various β [$\beta \to 0$: society "alert"; $\beta \to 1$: society "inattentive" to NGO messages], which maps donor types λ^{true} to NGO delegated types λ^{del}.

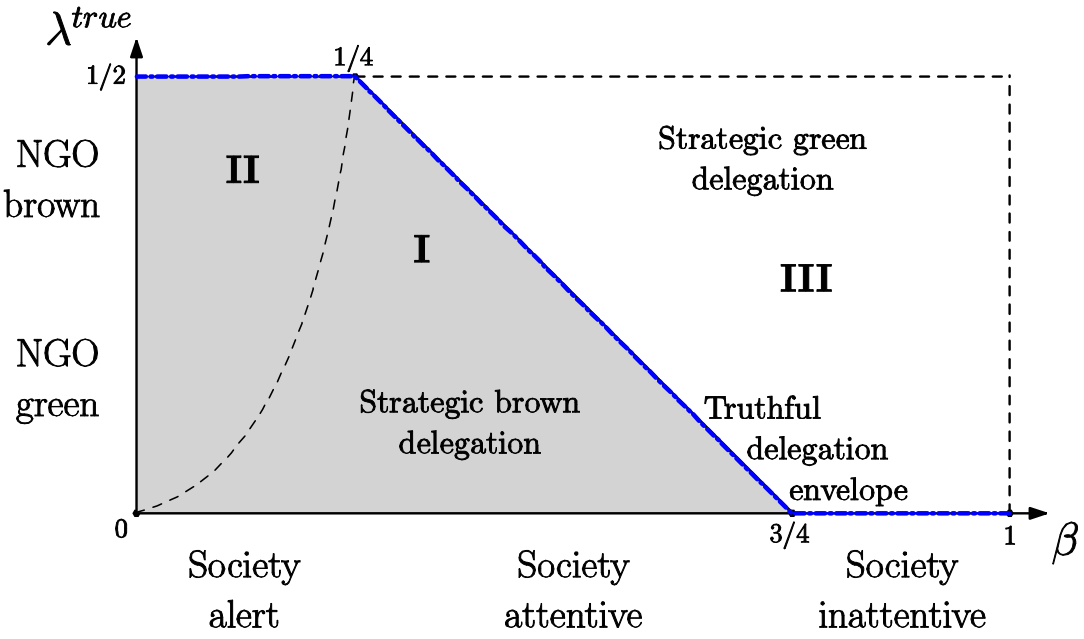

Figure 5: Strategic delegation

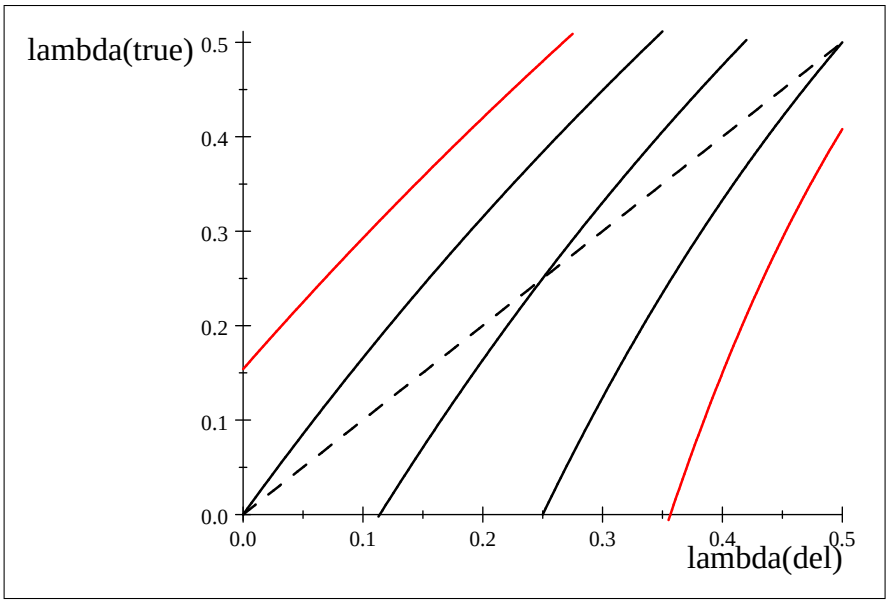

Figure 6: Inverse function $\lambda^{true}(\lambda^{del})$ for $\beta \to 0$ (lower envelope), for $\beta \to 1$ (upper envelope) and also for $\beta = \{1/4, 1/2, 3/4\}$.